All India Test Series (2023-24)

Test Code: ANY/02

AITS TEST - 02

YAKEEN NEET

DURATION: 200 Minutes | **DATE: 24/12/2023** | **M. MARKS: 720**

Topics Covered

Physics:	AITS-1 + Work, Power & Energy, Circular motion, System of Particles, COM (including Motion of COM), Rotational Motion, Mechanical Properties of Solids
Chemistry:	AITS-1 + IUPAC Nomenclature, Thermodynamics, Isomerism
Botany:	AITS-1 + Plant Kingdom, Morphology of Flowering Plants, Anatomy of Flowering Plants
Zoology:	AITS-1 + Excretory Products and Their Elimination, Locomotion and Movement, Neural Control and Coordination

General Instructions:

1. Immediately fill in the particulars on this page of the test booklet.
2. The test is of **3 hours 20 minutes** duration and the Test Booklet contains **200** multiple choice questions (four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology)**. **50** questions in each subject are divided into **two sections (A and B)** as per details given below:
   (a) **Section A** shall consist of **35 (Thirty-five)** Questions in each subject (Question Nos. – 1 to 35, 51 to 85, 101 to 135 and 151 to 185). All Questions are compulsory.
   (b) **Section B** shall consist of **15 (Fifteen)** questions in each subject (Question Nos. – 36 to 50, 86 to 100, 136 to 150 and 186 to 200). In section B, a candidate needs to **attempt any 10 (Ten)** questions out of **15 (Fifteen)** in each subject.
   Candidates are advised to read all 15 questions in each subject of Section-B before they start attempting the question paper. In the event of a candidate attempting more than ten questions, **the first ten questions answered by the candidate shall be evaluated.**
3. There is only one correct response for each question.
4. Each **correct** answer will give **4 Mark** while **1 Mark** will be **deducted** for a **wrong** answer. The maximum marks are 720.
5. No student is allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, any electronic device, etc. inside the examination room/hall.
6. On completion of the test, the candidate must hand over the Answer Sheet to the Invigilator on duty in the Room/Hall. However, the candidates are allowed to take away this Test Booklet with them.

OMR Instructions:

1. Use blue/black dark ballpoint pen.
2. Darken the bubbles completely. Don't put a tick mark or a cross mark where it is specified that you fill the bubbles completely. Half-filled or over-filled bubbles will not be read by the software.
3. Never use pencils to mark your answers.
4. Never use whiteners to rectify filling errors as they may disrupt the scanning and evaluation process.
5. Writing on the OMR Sheet is permitted on the specified area only and even small marks other than the specified area may create problems during the evaluation.
6. Multiple markings will be treated as invalid responses.
7. **Do not fold or make any stray mark on the Answer Sheet (OMR).**

Name of the Student (In CAPITALS): _____

Roll Number: _____

OMR Bar Code Number: _____

Student's Signature: _____ **Invigilator's Signature** _____

(PHYSICS)

SECTION-A

1. The slope of straight line $\sqrt{3}x = 3y + 5$ is;

(1) 3 (2) $\sqrt{3}$

(3) $\frac{1}{\sqrt{3}}$ (4) $\frac{1}{3}$

2. Which of the following combinations of three dimensionally different physical quantities *X*, *Y*, *Z* can never be a meaningful quantity?

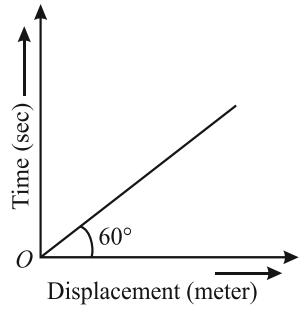
(1) $XZ - Y$

(2) $\frac{XZ^2}{Y}$

(3) $\frac{X^2 - Y^2}{Z}$

(4) $\frac{XY - Z^2}{XZ}$

3. The displacement-time graph of a particle moving in straight line is given below. Find out the velocity of the particle.



(1) $\frac{1}{\sqrt{3}}$ m/s (2) 3 m/s

(3) $\sqrt{3}$ m/s (4) $\frac{1}{3}$ m/s

4. A projectile has a time-of-flight *T* and range *R*. If the time of flight is tripled, what will be the new range while keeping the angle of projection constant?

(1) $\frac{R}{6}$ (2) $\frac{R}{3}$

(3) $3R$ (4) $9R$

5. A spring of spring constant 5×10^3 N/m is elongated initially by 15 cm from the unstretched position. Then the work required to elongate further by another 15 cm is;

(1) 62.5 J

(2) 125 J

(3) 168.75 J

(4) 250 J

6. The displacement *y* of a particle moving in one dimension under the action of a constant force is related to the time *t* by the equation $t = y^{1/3} + 5$, where *y* is in meter and *t* is in seconds. The work done by the force in the first 10 seconds is;

(1) 95 J (2) 65 J

(3) 0 J (4) 35 J

7. Two masses of 9 gm and 25 gm are moving with equal kinetic energies. The ratio of the magnitudes of their linear momenta is;

(1) 5 : 3

(2) $\sqrt{5}$: 3

(3) 3 : 5

(4) 1 : 9

8. A ball of mass 0.36 kg attached to the end of a string of length 2.25 m is moving in a horizontal circle. The string will break if the tension is more than 36 N. What is the maximum speed with which the ball can be moved?

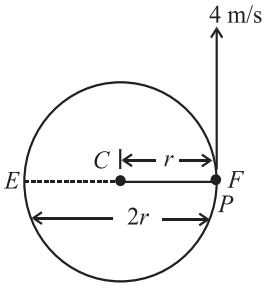
(1) 15 m/s

(2) 13 m/s

(3) 4.5 m/s

(4) 14 m/s

9. A particle *P* is moving in a circle of radius '*r*' with a uniform speed of 4 m/s as shown in figure. When passing through *F* the angular velocity of *P* about *E* and *C* are in the ratio;



(1) 1 : 1 (2) 1 : 2

(3) 2 : 1 (4) 4 : 1

10. The velocities of three particles of masses 40 gm, 60 gm and 100 gm are $15\hat{i}, 15\hat{j}$ and $15\hat{k}$ (in m/s) respectively. The velocity (in m/s) of the centre of mass of the three particles is;

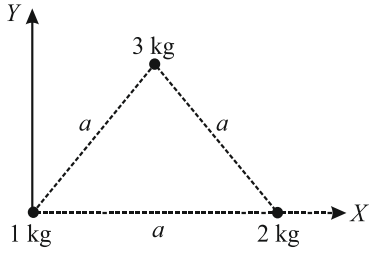
(1) $3\hat{i} + 4.5\hat{j} + 7.5\hat{k}$

(2) $15(\hat{i} + \hat{j} + \hat{k})$

(3) $20\hat{i} + 30\hat{j} + 5\hat{k}$

(4) $40\hat{i} + 60\hat{j} + 100\hat{k}$

11. Three masses 1 kg, 2 kg and 3 kg are lying at the corners of an equilateral triangle of side *a* as shown below. The (X) coordinate of center of mass is;



(1) $\frac{7}{12}a$

(2) $\frac{5}{9}a$

(3) $\frac{7\sqrt{2}}{9}a$

(4) $\frac{\sqrt{5}}{9}a$

12. A motor car travels at 50 m/s on a circular road of radius 1000 m. It is increasing its speed at the rate of 2.5 m/s^2. The acceleration of the car at this instant is;

(1) $5\sqrt{2}$ (2) $\frac{5}{\sqrt{2}}$

(3) $10\sqrt{2}$ (4) $\frac{15}{\sqrt{2}}$

13. Select the **wrong** statement.

(A) Deforming Force – Force that change configuration of body

(B) Elasticity – Property of regaining original configuration

(C) Plastic body – Can be easily melted

(D) Elastic limit – beyond which the property of plasticity of the material vanishes

(1) A and C

(2) A and B

(3) C and D

(4) B and C

14. Given that *p* is the momentum, *m* is mass, *r* is radius and *g* is acceleration due to gravity. Which of the following is dimensionless.

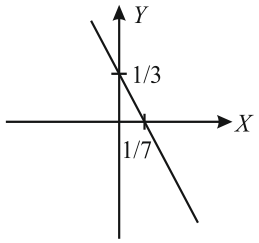
(1) $\frac{p^2 g}{rm}$

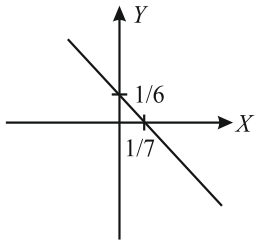
(2) $p^2 r g m^2$

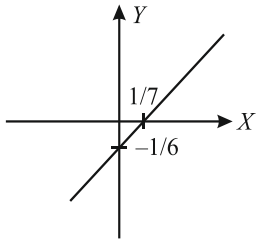
(3) $p r^2 g m$

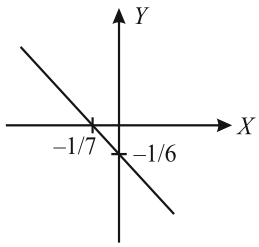
(4) $\frac{p^2}{r g m^2}$

15. Correct graph of $7x + 6y + 1 = 0$ is;

(1)


(2)


(3)


(4)


16. If $\vec{A} = 4\hat{i} + 5\hat{j}$ and $\vec{B} = 2\hat{i} + 2\hat{j} + 4\hat{k}$ then find out a unit vector along $\vec{A} + \vec{B}$.

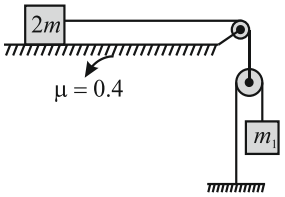
(1) $\frac{6\hat{i} + 7\hat{j} - 4\hat{k}}{\sqrt{101}}$

(2) $\frac{6\hat{i} - 7\hat{j} + 4\hat{k}}{\sqrt{101}}$

(3) $\frac{3\hat{i} + 7\hat{j} + 4\hat{k}}{\sqrt{101}}$

(4) $\frac{6\hat{i} + 7\hat{j} + 4\hat{k}}{\sqrt{101}}$

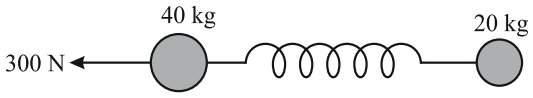
17. The maximum value of the block m_1 for which the system will remain in equilibrium (coefficient of friction between block 2*m* and plane surface is μ = 0.4, Pulleys are massless) is;



(1) $\frac{2}{5}m$ (2) $\frac{m}{2}$

(3) $\frac{4}{5}m$ (4) $\frac{3}{5}m$

18. Two masses of 20 kg and 40 kg respectively are connected by a massless spring as shown in figure. A force of 300 N acts on the 40 kg mass at the instant when the 20 kg mass has an acceleration of 14 ms^{-2} towards left, the acceleration of the 40 kg mass is;



(1) $\frac{1}{4}$ ms^{-2} (2) $\frac{1}{2}$ ms^{-2}

(3) 5 ms^{-2} (4) 2 ms^{-2}

19. Two wires of same materials and radius have their lengths in the ratio 5 : 7. If these wires are stretched by same force, then strain produced in the two wires will be in the ratio;

(1) 1 : 1

(2) 5 : 7

(3) 4 : 3

(4) 2 : 3

20. A road is banked at an angle of 60° to the horizontal for negotiating a curve of radius = $\frac{40}{\sqrt{3}}$ m. At what velocity will a car experience no friction while negotiating the curve?

(1) 54 km/hr

(2) 36 km/hr

(3) 72 km/hr

(4) 18 km/hr

21. Find the work done in pushing a block of mass 15 kg from bottom to the top of a frictionless inclined plane 12 m long and 5 m high. (g = 9.8 m/sec^2)

(1) 692 J (2) 735 J

(3) 198 J (4) 3.98 J

22. A body of mass M is dropped from a height h on a sand floor. If the body penetrates x cm into the sand and the average resistance offered by the sand to the body is F, then the expression for x is;

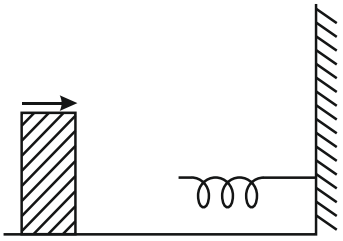
(1) $\frac{h}{\frac{F}{Mg}+1}$

(2) $\frac{h}{\frac{F}{Mg}-1}$

(3) $\frac{h}{\frac{F}{Mg}}$

(4) $2h$

23. A 2.0 kg block collides with a horizontal weightless spring of force constant 4.5 Nm^{-1} as shown in figure. The block compresses the spring 8.0 m before coming to rest. If the coefficient of kinetic friction between the block and horizontal surface is 0.5, the speed of the block at the instant of collision with the spring is approximately;



(1) 1.5 ms^{-1} (2) 14 ms^{-1}

(3) 150 ms^{-1} (4) 15 ms^{-1}

24. The potential energy for a force field $\vec{F}$ is given by $U(x, y) = \sin(x - y)$. The force acting on the particle of mass m at $\left(0, \frac{\pi}{2}\right)$ is;

(1) 0 (2) $\sqrt{2}$

(3) $\frac{1}{\sqrt{2}}$ (4) 1

25. A particle of mass m is moving in a circular path of constant radius r such that its centripetal acceleration a_c is varying with time t as $a_c = p^3 r t^2$, where p is a constant, the power delivered to the particle by the forces acting on it is;

(1) $2\pi m p^3 r^2 t$ (2) $m p^3 r^2 t$

(3) $(m p^6 r^2 t^5)/3$ (4) 0

26. A stone of mass 8 kg is attached to a string 72 m long and is whirled in a horizontal smooth surface. The maximum speed of revolution of the stone without breaking the string is 24 m/s. The maximum tension that the string can withstand is;

(1) 16 N (2) 32 N

(3) 128 N (4) 64 N

27. The position vectors of three particles of mass m_1 = 2 kg, m_2 = 3 kg and m_3 = 4 kg are $\vec{r}_1 = (\hat{i} + 5\hat{j} + \hat{k})$, $\vec{r}_2 = (\hat{i} + 2\hat{j} + \hat{k})$ and $\vec{r}_3 = (2\hat{i} + \hat{j} - 2\hat{k})$ respectively. Find the position vector of their centre of mass.

(1) $\frac{13\hat{i} + 20\hat{j} - 3\hat{k}}{9}$ (2) $\frac{13\hat{i} + 20\hat{j} + 3\hat{k}}{9}$

(3) $\frac{13\hat{i} - 20\hat{j} + 3\hat{k}}{9}$ (4) $\frac{13\hat{i} - 20\hat{j} - 3\hat{k}}{9}$

28. The moment of inertia and rotational kinetic energy of a fly wheel are 30 kg-m^2 and 1500 joule respectively. Its frequency (in revolution per second) would be;

(1) $\frac{600}{\pi}$ (2) $\frac{25}{\pi^2}$

(3) $\frac{5}{\pi}$ (4) $\frac{300}{\pi}$

29. A particle of mass $\sqrt{2}$ kg located at the position $(\hat{i}+\hat{k})$ m has a velocity $3(\hat{i}-\hat{j}+\hat{k})$ m/s. Its magnitude of angular momentum about origin in kg-m^2/s is;

(1) zero (2) 9

(3) 12 (4) 6

30. If a man increases his speed by 3 m/s then his kinetic energy is tripled. The original speed of the man is

(1) $(3+\sqrt{3})$ m/s (2) $\frac{3(\sqrt{3}+1)}{2}$

(3) $\frac{3(\sqrt{3}+2)}{2}$ (4) $\frac{3(\sqrt{3}+2)}{4}$

31. The moment of inertia of uniform circular disc of mass *M* and radius *R* about a line perpendicular to the plane of the disc passing through a point at a distance of $\frac{R}{2}$ from the centre of the disc is.

(1) $\frac{3MR^2}{4}$ (2) $\frac{MR^2}{4}$

(3) $\frac{5MR^2}{4}$ (4) $\frac{7MR^2}{4}$

32. A uniform heavy rod of mass 20 kg, cross sectional area 0.4 m^2 and length 20 m is hanging from a fixed support. Neglecting the lateral contraction, the elongation in the rod due to its own weight is $5x \times 10^{-9}$ m. The value of *x* is

(Given, young modulus $Y = 2 \times 10^{11}$ Nm^{-2} and g = 10 ms^{-2})

(1) 10 (2) 5

(3) 15 (4) 25

33. A body of radius *R* and mass *m* is rolling horizontally without slipping with speed *v*. It then rolls up a hill to a maximum height $h = \frac{7v^2}{10g}$. The body might be a;

(1) solid sphere. (2) hollow sphere.

(3) disc. (4) ring.

34. A particle is projected at 45° to the horizontal with a kinetic energy '*K*'. Find the kinetic energy at the highest point?

(1) $\frac{K}{2}$

(2) $\frac{K}{4}$

(3) *K*

(4) 0

35. **Assertion (A):** Potential energy of a stretched or compressed spring is linearly proportional to extension or compression.

Reason (R): Graph between potential energy of a spring versus the extension or compression of the spring is a parabola.

(1) Both **Assertion (A)** and **Reason (R)** are the true, and **Reason (R)** is a correct explanation of **Assertion (A)**.

(2) Both **Assertion (A)** and **Reason (R)** are the true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.

(3) **Assertion (A)** is false, and **Reason (R)** is false.

(4) **Assertion (A)** is false, and **Reason (R)** is true.

SECTION-B

36. A body falls on a surface of coefficient of restitution 0.4 from a height of 2 m, then the body rebounds to a height of;

(1) 0.6 m

(2) 0.4 m

(3) 2 m

(4) 0.32 m

37. **Assertion (A):** The velocity of a body at the bottom of an inclined plane of given height, is less when it slides down the smooth plane, compared to when it is rolling down the rough plane.

Reason (R): In rolling down, a body acquires both kinetic energy of translation and rotation.

(1) Both **Assertion (A)** and **Reason (R)** are the true, and **Reason (R)** is a correct explanation of **Assertion (A)**.

(2) Both **Assertion (A)** and **Reason (R)** are the true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.

(3) **Assertion (A)** is true, and **Reason (R)** is false.

(4) **Assertion (A)** is false, and **Reason (R)** is true.

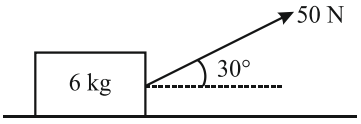
38. Match the statement given in **List-I** with statement given in **List-II**.

List-I		List-II	
(I)	If $\|\vec{A}\| = 2\|\vec{B}\|$ and $\|\vec{A}+\vec{B}\| = \|\vec{B}\|$ then angle between $\vec{A}$ and $\vec{B}$ is	(A)	90°
(II)	Magnitude of resultant of two forces $\|\vec{F}_1\|$ = 10N and $\|\vec{F}_2\|$ = 16N may be	(B)	180°
(III)	Angle between $\vec{A} = \hat{i} + \hat{j}$ & $\vec{B} = 5\hat{k}$ is	(C)	26N
(IV)	Magnitude of resultant of vectors $\vec{A} = \hat{i} + 2\hat{j}$ & $\vec{B} = 4\hat{k}$ is	(D)	$\sqrt{21}$

(1) I-B, II-C, III-A, IV-D
(2) I-C, II-B, III-D, IV-A
(3) I-D, II-B, III-A, IV-C
(4) I-B, II-C, III-D, IV-A

39. Mark the **incorrect** statement(s) for a particle going on a straight line
(A) If the velocity is zero at any instant, the acceleration should also be zero at the instant.
(B) If the velocity and acceleration have opposite sign, the object is speeding up.
(C) If the position and velocity have opposite sign, the particle is moving away from the origin.
(1) A and B
(2) Only A
(3) All of these
(4) Only C

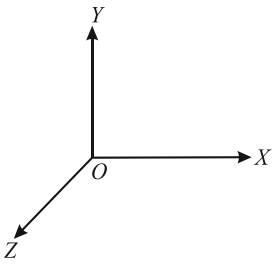
40. Adjoining figure shows a force of 50 N acting at 30° to the horizontal on a body of mass 6 kg. Assuming that the acceleration of free-fall is 10 ms^{-2}, which of the following statement(s) is/are **correct** (Contact surfaces are frictionless)?



I. The horizontal force acting on the body is 25N
II. The weight of the 6 kg mass acts vertically downwards
III. The net vertical force acting on the body is 35N
(1) I, II, III
(2) I, II
(3) I only
(4) II only

41. Consider the following statement(s).
(A) CM of a uniform semicircular disc of radius R is $2R/3\pi$ from the centre on the bisector.
(B) CM of a uniform semicircular ring of radius R is $4R/3\pi$ from the centre on the bisector
(C) CM of a solid hemisphere of radius R is $3R/8$ from the centre on the bisector.
(D) CM of a hemisphere shell of radius R is $R/2$ from the centre on the bisector.
Which statements is/are **correct**?
(1) D only (2) A, B, C, D
(3) C, D (4) A, B

42. A force of $-\hat{k}$ acts on O, the origin of the coordinate system. The torque about the point (2, –3) is;



(1) $(3\hat{i})+(2\hat{j})$ (2) $(-3\hat{i})+(2\hat{j})$
(3) $(3\hat{i})-(2\hat{j})$ (4) $(-3\hat{i})-(2\hat{j})$

43. A spherical ball contracts in volume by 0.040%, when subjected to a normal uniform pressure of 200 atmosphere. The Bulk modulus of its material is;
(1) 1×10^{11} N/m^2
(2) 2.5×10^{10} N/m^2
(3) 5.05×10^{10} N/m^2
(4) 1.05×10^{13} N/m^2

44. A particle moves in xy plane. The position vector at any time t is $\vec{r} = \{(3t)\hat{i} + (4t^2)\hat{j}\}m$. The rate of change of θ at time t = 3 second (where θ is the angle which its velocity vector makes with positive x-axis) is;
(1) $\frac{8}{195}$ rad/s (2) $\frac{1}{195}$ rad/s
(3) $\frac{195}{8}$ rad/s (4) $\frac{6}{195}$ rad/s

45. A metal wire of length $3L$, area of cross-section $4A$ and young modulus Y behaves as a spring of spring constant k. The expression of k is;
(1) $\frac{AY}{L}$ (2) $\frac{AY}{4L}$
(3) $\frac{3AY}{4L}$ (4) $\frac{4AY}{3L}$

46. A man goes up in a uniformly accelerated lift. He return downward with the lift accelerating down at the same rate. The ratio of apparent weights in the two cases is 3 : 1. The acceleration of the lift is;

(1) $\frac{g}{2}$ (2) $\frac{g}{3}$

(3) $\frac{g}{5}$ (4) $\frac{g}{6}$

47. Two springs of spring constants $3k$ and $4k$ are joined in series. The effective spring constant of the combination is given by;

(1) $\sqrt{12}k$ (2) $\frac{7k}{2}$

(3) $7k$ (4) $\frac{12k}{7}$

48. The internal and external radius of a hollow cylinder are measured to be (2.23 ± 0.01) cm and (3.79 ± 0.02) cm. The thickness of the wall of the cylinder is;

(1) (1.56 ± 0.03) cm
(2) (0.56 ± 0.03) cm
(3) (1.56 ± 0.01) cm
(4) (2.56 ± 0.02) cm

49. A horizontal force $F = mg/4$ is applied on the upper surface of a uniform cube of mass 'm' and side 'a' which is resting on a rough horizontal surface having $\mu_s = 1/3$. The distance between lines of action of 'mg' and normal reaction 'N' is;

(1) $\frac{a}{5}$ (2) $\frac{a}{4}$

(3) $\frac{a}{3}$ (4) $\frac{a}{6}$

50. A particle of mass 0.1 kg is subjected to a force $F = -kx$ with $k = 20\ Nm^{-1}$. What will be magnitude of its initial acceleration, if it is released from a point 15 cm away from the origin?

(1) 30 m/s^2
(2) 40 m/s^2
(3) 10 m/s^2
(4) 50 m/s^2

(CHEMISTRY)

SECTION-A

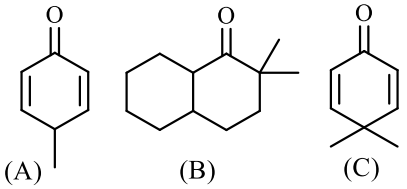
51. How much time it would take to spend ten Avogadro's number of rupees at a rate of 1 lakh of rupees per second?

(1) 1.90×10^9 years
(2) 1.90×10^{12} years
(3) 1.90×10^{11} years
(4) 1.90×10^{10} years

52. The average atomic mass of an element Z is 40.6. If it exists in two isotopic form Z^{40} and Z^{41}.Then the abundance of each isotopic forms;

(1) Z^{40} (15%), Z^{41} (85%)
(2) Z^{40} (60%), Z^{41} (40%)
(3) Z^{40} (40%), Z^{41} (60%)
(4) Z^{40} (85%), Z^{41} (15%)

53. Identify the compounds which can exhibit tautomerism?



(A) (B) (C)

(1) A only (2) A and B
(3) B and C (4) All of these

54. Match **List-I** with **List-II** to find out the **correct** option.

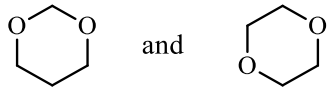
List-I		List-II	
I.	Solution containing 954.6gm of $CaCl_2$ in 1L.	A.	8.6 M
II.	Volume of 6.022×10^{24} molecules of water at 4°C.	B.	3.64 M
III.	Volume of 0.2M NaOH solution containing 40mg of NaOH.	C.	5 mL
IV.	20% (w/w) solution of KOH (density of solution = 1.02gm/mL))	D.	180 mL

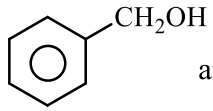
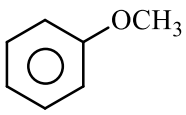
(1) I-(B); II-(A); III-(D); IV-(C)
(2) I-(A); II-(C); III-(D); IV-(B)
(3) I-(C); II-(D); III-(A); IV-(B)
(4) I-(A); II-(D); III-(C); IV-(B)

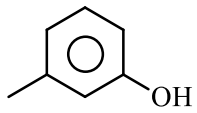
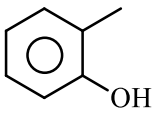
55. Metal M has atomic mass of 23. Oxide of this metal has 26% by mass of oxygen. The empirical formula of the oxide;

(1) M_2O (2) M_2O_3
(3) MO (4) M_3O_4

56. Which of the following pairs of compounds are not positional isomers?

(1)  and

(2)  and 

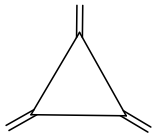
(3)  and 

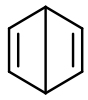
(4) All of these

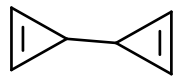
57. 2.24 ml of a gas is produced at S.T.P. by the action of 5.6mg of alcohol with Methylmagnesium bromide. The molecular mass of alcohol is;

(1) 16.0
(2) 41.2
(3) 56.0
(4) 156.0

58. Which of the following is isomer of benzene?

(1) 

(2) 

(3) 

(4) All of these

59. The fluoride content in a 600g toothpaste sample is 0.5g. Concentration of fluoride ions in parts per million is;

(1) 833.33 (2) 250
(3) 456.15 (4) 654

60. The volume of CO_2 released at S.T.P. on heating 10 g of $CaCO_3$, assuming that it is fully decomposed, will be (Atomic mass of Ca=40);

(1) 1.12L (2) 2.24 L
(3) 4.06 L (4) 0.84 L

61. The uncertainty in the position of an electron (mass = 9.1×10^{-28} g) moving with a velocity of 4.0×10^5 cm s^{-1} accurate upto 0.014% will be;

(1) 1.92 cm (2) 2.68 cm
(3) 0.175 cm (4) 0.010 cm

62. **Assertion (A):** Alkyl halides can exhibit functional isomerism.

Reason (R): Functional isomers are structural isomers that have the same molecular formula but have different functional groups.

(1) Both **Assertion (A)** and **Reason (R)** are true, and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion (A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true

63. Which of the following levels of H and Li^{+2} have same energy respectively?

(A) 1, 3
(B) 2, 6
(C) 1, 4
(D) 2, 4

(1) A and B (2) A and D
(3) C and D (4) B and D

64. How many spectral lines are produced in the spectrum of hydrogen atom from 6^{th} energy level?

(1) 5 (2) 15
(3) 10 (4) 4

65. The number of chain isomers for C_4H_{10} and C_5H_{12} are, respectively;

(1) 2, 3 (2) 2, 5
(3) 2, 4 (4) 3, 5

66. A gas emits light at two wavelengths after absorbing a photon of 300 nm. If one of the emissions is at 500 nm, then the other is at;

(1) 1035 nm (2) 325 nm
(3) 750 nm (4) 298 nm

67. From an excited state to the ground state of certain transition in H spectrum in one or more steps gives rise to a total of 6 lines. How many of these belong to the UV spectrum?

(1) 5 (2) 4
(3) 6 (4) 3

68. Which atom has maximum magnetic moment if Hund's rule is not obeyed by some of elements given below?

(1) Ti (2) Mn
(3) Fe (4) Zn

69. A piston filled with 0.05 mol of an ideal gas, expands reversibly from 100mL to 500mL at a constant temperature of 47.0°C. As it does so, it absorbs 214.4 J of heat. The values of q and W for the process will be;
(R=8.314 J/mol K, log(5) = 0.70)
(1) q = +214.4 J, W = + 214.4 J
(2) q = +214.4 J, W = –214.4 J
(3) q = –214.4 J, W = –214.4 J
(4) q = –214.4 J, W = + 214.4 J

70. What is the maximum number of electrons that can be associated with the following set of quantum numbers n = 4, l = 2 and m = –1?
(1) 2 (2) 4
(3) 6 (4) 10

71. From the following reactions, only one is a redox reaction. Identify it;
(1) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
(2) $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$
(3) $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$
(4) $2HgCl_2 + SnCl_2 \rightarrow Hg_2Cl_2 + SnCl_4$

72. What will be the change in oxidation state of Mn when $KMnO_4$ is reduced in acidic aqueous solution with iodide ion?
(1) +7 to +2 (2) +5 to +3
(3) +6 to +3 (4) +4 to +2

73. What will be the value of (x + y – z) in the following equation?
$aK_2CrO_4 + bHCl \rightarrow xK_2Cr_2O_7 + yKCl + zH_2O$
(1) 2 (2) 4
(3) 3 (4) 5

74. Which of the following statement(s) is/are correct for the given reaction?
$Cu_2S + 2FeO \rightarrow 2Cu + 2Fe + SO_2$
A. Ferrous oxide is reduced to Fe
B. Copper(I) sulfide is oxidised to Copper.
C. It is an example of disproportionation reaction.
D. It is an example of redox reaction.
(1) A, B and D (2) A and D
(3) B and C (4) D only

75. What is the final temperature of 0.20 mole monoatomic ideal gas that performs 100 cal of work adiabatically if the initial temperature is 257°C? (use R = 2 $calK^{-1}mol^{-1}$)
(1) 450 K (2) 360 K
(3) 359 K (4) 697 K

76. How many moles of $KMnO_4$ are required to oxidise one mole of Ferrous oxalate in acidic medium?
(1) $\frac{1}{5}$ (2) $\frac{2}{5}$
(3) $\frac{3}{5}$ (4) $\frac{4}{5}$

77. Match the **List-I** with **List-II** and choose the **correct** option.

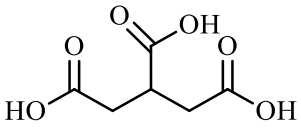
	List-I		List-II
A.	$Na(s) \rightarrow Na(g); \Delta H_1$	I.	Enthalpy of atomisation
B.	$C_4H_{10} + \frac{13}{2}O_2 \rightarrow 4CO_2 + 5H_2O; \Delta H_2$	II.	Enthalpy of formation
C.	$CH_4 \rightarrow C + 4H; \Delta H_3$	III.	Enthalpy of combustion
D.	$H_2 + Br_2 \rightarrow 2HBr; \Delta H_4$	IV.	Enthalpy of sublimation

(1) A-IV; B-III; C-I; D-II
(2) A-II; B-III; C-I; D-IV
(3) A-III; B-I; C-II; D-IV
(4) A-I; B-II; C-IV; D-III

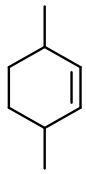
78. Oxidation number of Cr atom in K_3CrO_8 respectively;
(1) +5 (2) +6
(3) +3 (4) +4

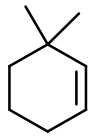
79. The correct IUPAC name of compound $H_3C-CH_2-CH_2-\underset{\underset{O}{\|}}{C}-\underset{\underset{CN}{|}}{CH}-CHO$ is;
(1) 2–Cyano–3–oxohexanal
(2) 2-Formyl–3–oxohexanenitrile
(3) 2–Cyanohexane–1,3–dione
(4) 1, 3–Dioxo–2–cyanohexane

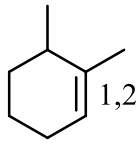
80. Which of the following is an extensive property and a state function?
(1) Internal energy
(2) Refractive index
(3) Molar heat capacity
(4) Density

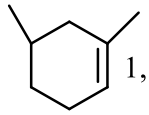
81.  has the IUPAC name;
(1) Propane-1,2,3-tricarboxylic acid
(2) 3-Carboxyl pentane-1,5-dioic acid
(3) Pentane-1,2,3-trioic acid
(4) 2-Ethylcarboxyl butan-1,4-dioic acid

82. Which of the following IUPAC name is **incorrect**?

(1)  3,6-Dimethylcyclohexene

(2)  3, 3-Dimethylcyclohexene

(3)  1,2-Dimethylcyclohexene

(4)  1, 5- Dimethylcyclohexene

83. Which of the following reactions is associated with negative change in entropy?

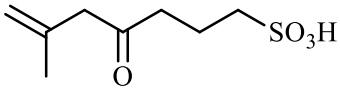
(1) $2C\ (graphite) + O_2\ (g) \rightarrow 2CO\ (g)$

(2) $3C_2H_2\ (g) \rightarrow C_6H_6\ (1)$

(3) $2SO_3\ (g) \rightarrow 2SO_2\ (g) + O_2\ (g)$

(4) $C_2H_6\ (g) \rightarrow C_2H_4\ (g) + H_2\ (g)$

84. The **correct** IUPAC name of the compound is;



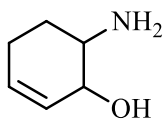
(1) 6-Ethyl-1-methyl-4-oxohept-6-ene-1-sulphonic acid

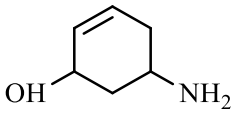
(2) 7-Ethyl-5-oxohept-7-ene-2-sulphonic acid

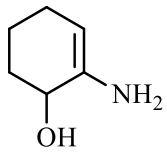
(3) 6-Methyl-4-oxohept-6-ene-1-sulphonic acid

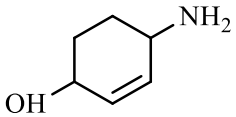
(4) 6-Methylene-4-oxononane-1-sulphonic acid

85. The correct structure of 6-Aminocyclohex-2-en-1-ol;

(1) 

(2) 

(3) 

(4) 

SECTION-B

86. A metal is 60% by mass in its oxide & molecular weight of MCl_x is 95. Then find atomic mass of metal.

(1) 11 (2) 24

(3) 18 (4) 27

87. A reaction between 3g of PbO and 5g of HCl yields how many moles of lead(II) chloride?

(1) 0.085 (2) 0.013

(3) 0.022 (4) 0.029

88. If the oxidation number of A is +1, B is +4 and that of C is –1, then the possible formula of the compound containing atoms of these elements;

(1) $A(B_4C)_2$ (2) ABC_5

(3) $A(BC_2)$ (4) $A_2(BC_3)_2$

89. Product formed when trans-3-Hexene reacts with Br_2 is meso-3,4-dibromohexane its configuration will be;

(1) 3R, 4R (2) 3R, 4S

(3) 3S, 4S (4) None of these

90. What will be the number of revolutions made by an electron when it is in state n = 3 before it suffers a transition to state n = 1. Given that the average life of an excited state of hydrogen atom is of 4×10^{-7} s?

(1) 9.7×10^7 (2) 9.7×10^6

(3) 4.6×10^6 (4) 4.6×10^7

91. **Assertion (A):** The least stable conformer of n-butane is fully eclipsed.

Reason (R): The repulsion between both the methyl groups increases the steric strain in fully eclipsed conformer of n-butane.

(1) Both **Assertion (A)** and **Reason (R)** are true, and **Reason (R)** is a correct explanation of **Assertion (A)**.

(2) Both **Assertion (A)** and **Reason (R)** are true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.

(3) **Assertion (A)** is true, and **Reason (R)** is false.

(4) **Assertion (A)** is false, and **Reason (R)** is true

92. **Statement-I:** The radius of the second orbit of He^+ is twice that of the first orbit of hydrogen.

Statement-II: The radius of an orbit in H-like species is directly proportional to Z and inversely proportional to n^2.

(1) Statement I and Statement II both are correct.

(2) Statement I is correct, but Statement II is incorrect.

(3) Statement I is incorrect, but Statement II is correct.

(4) Statement I and Statement II both are incorrect.

93. **Statement-I:** Many endothermic reactions become spontaneous at high temperatures which are not spontaneous at room temperature.

Statement-II: Entropy of system decreases with an increase in temperature.

(1) Statement I and Statement II both are correct.
(2) Statement I is correct, but Statement II is incorrect.
(3) Statement I is incorrect, but Statement II is correct.
(4) Statement I and Statement II both are incorrect.

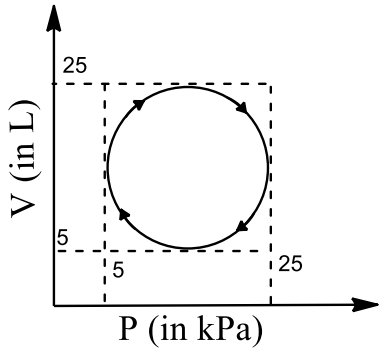
94. It is found that the maximum speed of the photoelectrons in the two cases differ by a factor of 3 when surface of a certain metal is first illuminated with light of wavelength $\lambda_1 = 250$ nm and then by the light of wavelength $\lambda_2 = 500$ nm. The work function of the metal (in eV) is close to (Energy of photon = $(1240/\lambda)$ eV);

(1) 5.68eV (2) 3.58 eV
(3) 2.17 eV (4) 1.85 eV

95. The equivalent weight of FeS_2 in the following reaction is $FeS_2 + MnO_4^- \rightarrow Fe^{3+} + H_2SO_4 + Mn^{+2}$. (M is the molecular weight of FeS_2)

(1) $\frac{M}{10}$ (2) $\frac{M}{1}$
(3) $\frac{M}{15}$ (4) $\frac{M}{9}$

96. Heat absorbed by a system which is going through a cyclic process shown in figure is;

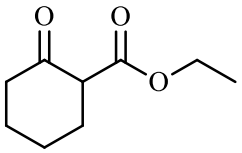


(1) $10^7 \pi$ J
(2) $10^6 \pi$ J
(3) $10^2 \pi$ J
(4) $10^4 \pi$ J

97. **Assertion (A):** Acidic solution of potassium dichromate is used to test drunk drivers by means of colour change.

Reason (R): The change in colour is due to the oxidation of alcohol with potassium dichromate to form acetic acid.

(1) Both **Assertion (A)** and **Reason (R)** are true, and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion (A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

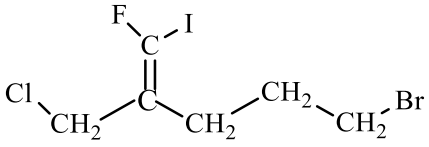
98.  has the IUPAC name;

(1) 2- Ethylcarbonate cyclohexanone
(2) 2-Cyclohexanone-1-carboxylate
(3) Ethyl-2-oxo cyclohexanecarboxylate
(4) 1-Keto-2-carboxylate cyclohexanone

99. A gas expands adiabatically at constant pressure such that $T \propto V^{-1/3}$. The value of (C_p/C_v) of the gas will be;

(1) 1.66 (2) 1.50
(3) 1.33 (4) 2

100. The **correct** IUPAC name of the compound is;



(1) 5-Bromo-1-chloro-2-fluoro-2-iodomethylbutene
(2) 5-Bromo-2-chloromethyl-1-fluoro-1-iodopent-1-ene
(3) 2-(2-Bromopropyl)-3-chloro-1-fluoro-1-iodoprop-1-ene
(4) 1-Bromo-4-chloromethyl-5-fluoro-5-iodopent-1-ene

(BOTANY)

SECTION-A

101. Match **List-I** with **List-II** and choose the **correct** option.

List-I		List-II	
I.	Chemotaxonomy	A.	used in plant taxonomy to resolve confusions
II.	Numerical taxonomy	B.	based on chromosome number
III.	Cytotaxonomy	C.	each character is given equal importance

(1) I-A; II-B; III-C
(2) I-A; II-C; III-B
(3) I-B; II-C; III-A
(4) I-C; II-A; III-B

102. Choose the **correct** statement from the following w.r.t Golgi apparatus.
(1) Materials to be packaged in the form of vesicles from the ER fuse with the *trans* face of the golgi apparatus.
(2) Materials to be packaged in the form of vesicles are released from the *cis* face of the golgi apparatus.
(3) An important site for the synthesis of steroidal hormones.
(4) Proteins are modified in the cisternae.

103. Flagellated pyriform (pear-shaped) gametes are characteristic of;
(1) Chlorophyceae
(2) Rhodophyceae
(3) Cyanobacteria
(4) Phaeophyceae

104. **Statement I:** The form of food stored in red algae is structurally similar to glycogen and amylopectin.
Statement II: Majority of the red algae are marine, even present at great depths in oceans where relatively little light penetrates.
(1) Statement I and Statement II both are correct.
(2) Statement I is correct, but Statement II is incorrect.
(3) Statement I is incorrect, but Statement II is correct.
(4) Statement I and Statement II both are incorrect.

105. How many of the following characteristics are **not** true for bryophytes?
A. commonly grow in moist shaded areas.
B. called reptiles of the plant kingdom.
C. play an important role in plant succession on bare rocks/soil.
D. true roots, stem or leaves are present.
(1) Four (2) One
(3) Two (4) Three

106. Pick the **mismatched** pair as far as the economic importance of the given organism is concerned.
(1) *Sphagnum*: provides material suitable for packaging of living material for trans-shipment.
(2) *Gelidium*: provides a substance suitable to grow microbes.
(3) *Marchantia*: used as soil binder.
(4) *Chlorella*: used as food supplement.

107. The major pigments in the class of algae that store their food in the form of floridean starch are;
(1) Chlorophyll *a, c*
(2) Chlorophyll *a, c,* phycoerythrin
(3) Chlorophyll *a, b,* fucoxanthin
(4) Chlorophyll *a, d,* phycoerythrin

108. Which of the following plants has an irregular flower?
(1) Canna (2) Bean
(3) Pea (4) Mustard

109. The type of placentation where ovary is one-chambered but it becomes two-chambered due to the formation of the false septum is found in;
(1) *Primrose* (2) *Dianthus*
(3) *Argemone* (4) China rose

110. How many of the following features are present in china rose?
Opposite phyllotaxy, inferior ovary, twisted aestivation, monoadelphous stamens, free central placentation
(1) Five (2) Two
(3) Four (4) Three

111. Pick the **incorrectly** matched pair.
(1) Stilt roots: provide support
(2) Tap roots of sweet potato: store food
(3) Underground stem of ginger: act as organs of perennation
(4) Thorns of *Citrus*: modified axillary buds for protection

112. **Assertion (A):** In racemose type of inflorescences, the growth of the main axis of the plant is not limited.
Reason (R): In racemose type of inflorescences the main axis continues to grow.
(1) Both **Assertion (A)** and **Reason (R)** are true, and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion (A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

113. The ovary demonstrated in the given figure is of which type?

(1) Superior (2) Inferior
(3) Half-inferior (4) None of these

114. In mango, the pericarp is well differentiated into an outer thin 'A', a middle fleshy edible 'B' and an inner stony hard 'C'. B, C and A, respectively, are;
(1) epicarp, mesocarp, endocarp
(2) epicarp, endocarp, mesocarp
(3) mesocarp, endocarp, epicarp
(4) endocarp, epicarp, mesocarp

115. **Statement I:** In isobilateral leaf, the stomata are present only on the upper epidermal surface.
Statement II: In isobilateral leaf, the mesophyll is well differentiated into palisade and spongy parenchyma.
(1) Statement I and Statement II both are correct.
(2) Statement I is correct, but Statement II is incorrect.
(3) Statement I is incorrect, but Statement II is correct.
(4) Statement I and Statement II both are incorrect.

116. In the stem of most of the dicotyledonous plants, layers below the epidermis are made up of;
(1) sclerenchyma.
(2) collenchyma.
(3) parenchyma.
(4) sclereids.

117. Bulliform cells are present on;
(1) adaxial surface of grasses.
(2) abaxial surface of grasses.
(3) adaxial surface of dicot leaf.
(4) abaxial surface of dicot leaf.

118. **Assertion (A):** The 'ring' arrangement of vascular bundles is a characteristic of dicot stem.
Reason (R): Each vascular bundle is conjoint, open and with endarch protoxylem in dicot stem.
(1) Both **Assertion (A)** and **Reason (R)** are true, and **Reason (R)** is a correct explanation of **Assertion (A).**
(2) Both **Assertion (A)** and **Reason (R)** are true, but **Reason (R)** is not a correct explanation of **Assertion (A).**
(3) **Assertion (A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

119. Choose the **incorrect** statement from the following w.r.t trichomes.
(1) They are usually multicellular.
(2) They may be branched or unbranched.
(3) They help in preventing water loss due to transpiration.
(4) They are unicellular.

120. Match **List-I** with **List-II** and choose the **correct** option.

List-I		**List-II**	
I.	Cuticle	A.	Prevents the loss of water
II.	Subsidiary cells	B.	Enclose stomatal pore
III.	Guard cells	C.	Regulate the process of transpiration and gaseous exchange
IV.	Stomata	D.	Epidermal cells specialized in their shape and size

(1) I-B; II-A; III-C; IV-D
(2) I-A; II-C; III-B; IV-D
(3) I-D; II-A; III-C; IV-B
(4) I-A; II-D; III-B; IV-C

121. Water-containing cavities are present within the vascular bundles in;
(1) dicot leaf.
(2) dicot stem.
(3) monocot leaf.
(4) monocot stem.

122. The innermost layer of the cortex in dicot root is called;
(1) Endodermis.
(2) Pericycle.
(3) Epiblema.
(4) Conjunctive tissue.

123. The floral formula given below represents the family $\oplus ♂♀ K_{2+2} C_4 A_{2+4} \underline{G}_{(2)}$
(1) Fabaceae
(2) Cruciferae
(3) Papilionoideae
(4) Leguminosae

124. Formation of synaptonemal complex takes place during _____ and dissolves during _____.
(1) leptotene, zygotene
(2) zygotene, diakinesis
(3) pachytene, diplotene
(4) zygotene, diplotene

125. Identify the **correct** statement from the following w.r.t ribosomes.
(1) They are composed of ribonucleic acid and proteins.
(2) They are surrounded by a single membrane.
(3) The two subunits of 80S ribosomes are 50S and 30S.
(4) The two subunits of 70S ribosomes are 50S and 40S.

126. Photosynthetic protists are;
(1) Euglenoids and Slime moulds.
(2) Euglenoids, Diatoms and Dinoflagellates.
(3) Diatoms and Sporozoans.
(4) Desmids and Ciliated protozoans.

127. **Statement I:** Vascular bundles are not a part of stele.
Statement II: All tissues inside the endodermis constitute the stele.
(1) Statement I and Statement II both are correct.
(2) Statement I is correct, but Statement II is incorrect.
(3) Statement I is incorrect, but Statement II is correct.
(4) Statement I and Statement II both are incorrect.

128. Sac-fungi includes all the following, **except**;
(1) *Penicillium* (2) *Saccharomyces*
(3) *Agaricus* (4) Truffles

129. Consider the following statements.
A. Spindle fibres attach to kinetochores of chromosomes.
B. Chromosomes are moved to spindle equator and get aligned along metaphase plate through spindle fibres from both poles.
Identify the **correct** stage of mitosis.
(1) Prophase
(2) Metaphase
(3) Anaphase
(4) Telophase

130. Match **List-I** with **List-II** and choose the **correct** option.

List-I (Common name)		**List-II (Scientific name)**	
I.	Lion	A.	*Panthera tigris*
II.	Leopard	B.	*Panthera leo*
III.	Tiger	C.	*Solanum tuberosum*
IV.	Potato	D.	*Panthera pardus*

(1) I-B; II-D; III-A; IV-C
(2) I-B; II-C; III-D; IV-A
(3) I-B; II-C; III-A; IV-D
(4) I-C; II-B; III-D; IV-A

131. Which of the following is/are the significance of meiosis?
(1) Conservation of specific chromosome number of each species across generations in sexually reproducing organisms.
(2) It reduces chromosome numbers by half.
(3) Causes genetic variability.
(4) All of these

132. As we go higher from species to kingdom, the number of common characteristics;
(1) first increases and then decreases.
(2) goes on increasing.
(3) remains constant.
(4) goes on decreasing.

133. All the following are correct w.r.t dorsiventral leaf, **except**
(1) Mesophyll, which possesses chloroplasts and carry out photosynthesis, is made up of sclerenchyma.
(2) The abaxial epidermis generally bears more stomata than the adaxial epidermis.
(3) Mesophyll has two types of cells – the palisade parenchyma and the spongy parenchyma.
(4) Both adaxial and abaxial epidermis of the leaf has a conspicuous cuticle.

134. Match **List-I** with **List-II** and select the **correct** option.

List-I		**List-II**	
I.	Perigynous Flower	A.	Lily
II.	Zygomorphic Flower	B.	Plum, Peach, Rose
III.	Syncarpous Ovary	C.	Pea, Bean, Gulmohar
IV.	Epiphyllous Flower	D.	Mustard, Tomato

(1) I-B; II-C; III-D, IV-A
(2) I-B; II-D; III-C, IV-A
(3) I-B; II-A; III-D, IV-C
(4) I-C; II-B; III-A, IV-D

135. Based on studies of Theodore Schwann what is the unique character of plant cells?
(1) Glycocalyx
(2) Middle lamella
(3) Cell wall
(4) Plasma membrane

SECTION-B

136. **Assertion (A):** Pteridophytes show events which are precursor to seed habit.
Reason (R): The development of the zygotes into young embryos take place within the female gametophytes which remain retained on the sporophyte.
(1) Both **Assertion (A)** and **Reason (R)** are true, and **Reason (R)** is a correct explanation of **Assertion (A).**
(2) Both **Assertion (A)** and **Reason (R)** are true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion (A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

137. A gymnosperm which is unbranched, dioecious and possesses coralloid roots, is;
(1) *Pinus* (2) *Cycas*
(3) *Sequoia* (4) *Cedrus*

138. All the following are the examples of different classes of pteridophytes, **except**;
(1) *Adiantum*
(2) *Equisetum*
(3) *Sphagnum*
(4) *Selaginella*

139. In a monocot seed, the outer covering of endosperm separates the embryo by a proteinaceous layer called;
(1) Scutellum
(2) Aleurone
(3) Coleoptile
(4) Coleorhiza

140. Match **List-I** and **List-II** and choose the **correct** option.

List-I (Type of aestivation)		**List-II (Example)**	
I.	Sepals or petals in a whorl just touch one another at the margin, without overlapping.	A.	*Calotropis*
II.	The margins of sepals or petals overlap one another but not in any particular direction.	B.	*Cassia*
III.	Five petals, the largest (standard) overlaps the two lateral petals (wings) which in turn overlap the two smallest anterior petals (keel).	C.	Bean

(1) I-B; II-C; III-A
(2) I-B; II-A; III-C
(3) I-A; II-B; III-C
(4) I-C; II-B; III-A

141. Which pair of the following statements is **incorrect**?
A. When a flower can be divided into two equal radial halves in any radial plane passing through the centre, it is said to be actinomorphic, eg. Gulmohar.
B. Bean, gram and pea have non-endospermous seeds.
C. The hilum is a scar on the seed coat through which the developing seeds were attached to the fruit.
D. Maize has two cotyledons.
(1) B and C
(2) A and C
(3) B and D
(4) A and D

142. Mark the following statements as **true (T)** or **false (F)** and choose the **correct** option.

A. Like bryophytes and pteridophytes, in gymnosperms the male and the female gametophytes have an independent free-living existence.

B. In the predominant gametophytic stage of the life cycle of a moss, the first stage is the protonema stage, which develops directly from a spore.

C. In the predominant gametophytic stage of the life cycle of a moss, the second stage is the leafy stage, which develops from the secondary protonema as a lateral bud.

	A	**B**	**C**
(1)	F	T	T
(2)	T	F	T
(3)	F	F	F
(4)	F	T	F

143. **Assertion (A):** The parenchymatous cells which lie between the xylem and the phloem are called pericycle.
Reason (R): Initiation of lateral roots and vascular cambium during secondary growth takes place in pericycle.

(1) Both **Assertion (A)** and **Reason (R)** are true, and **Reason (R)** is a correct explanation of **Assertion (A).**
(2) Both **Assertion (A)** and **Reason (R)** are true, but **Reason (R)** is not a correct explanation of **Assertion (A).**
(3) **Assertion (A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

144. Choose the **incorrect** statement from the following w.r.t casparian strips in dicotyledonous roots.

(1) Waxy in nature and made up of suberin.
(2) Obstruct the flow of water in the roots.
(3) Present in the innermost layer of cortex.
(4) It is a water-impermeable deposition in pericycle.

145. **Statement I:** In a sub-metacentric chromosome, the centromere is present close to its one end.
Statement II: In an acrocentric chromosome, the centromere is present slightly away from the middle of the chromosome.

(1) Statement I and Statement II both are correct.
(2) Statement I is correct, but Statement II is incorrect.
(3) Statement I is incorrect, but Statement II is correct.
(4) Statement I and Statement II both are incorrect.

146. The infectious material of viruses is;

(1) protein coat.
(2) genetic material.
(3) nucleoprotein.
(4) tail fibre.

147. Choose the **incorrect** statement from the following.

(1) The cells in G_0 stage of the cell cycle are metabolically inactive.
(2) Heart cells do not appear to exhibit division.
(3) Occasionally, dividing cells exit G_1 phase to enter an inactive stage called G_0 stage of the cell cycle.
(4) Cells in G_0 stage can proliferate further if called on to do so.

148. **Statement I:** Biological names are generally in italics and written in Latin.
Statement II: Biological names are Latinised or derived from Latin irrespective of their origin.

(1) Statement I and Statement II both are correct.
(2) Statement I is correct, but Statement II is incorrect.
(3) Statement I is incorrect, but Statement II is correct.
(4) Statement I and Statement II both are incorrect.

149. **Assertion (A):** The interphase of a typical human cell lasts for approximately 20 hours per cell cycle.
Reason (R): The M-phase lasts less than 5% of the duration of cell cycle.

(1) Both **Assertion (A)** and **Reason (R)** are true, and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion (A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

150. Fusion between one large static female gamete and smaller motile male gamete is termed as ___ as seen in ____.

(1) Oogamous, *Volvox*
(2) Isogamous, *Spirogyra*
(3) Anisogamous, *Fucus*
(4) Oogamous, *Ulothrix*

(ZOOLOGY)

SECTION-A

151. Excretory product in most of the marine fishes is;
(1) ammonia. (2) urea.
(3) uric acid. (4) Both (1) and (2)

152. During muscle contraction, an increase in Ca^{++} level leads to the binding of calcium with a subunit of _____ on actin filaments and thereby removes the masking of active sites for_____. Choose the option which **correctly** fills the blank.
(1) troponin; myosin
(2) troponin; tropomyosin
(3) tropomyosin; troponin
(4) myosin; troponin

153. **Statement I:** Plasma is the medium of transport for O_2 and CO_2.
Statement II: About 97 per cent of O_2 is transported by RBCs in the blood. The remaining 3 per cent of O_2 is carried in a dissolved state through the plasma.
(1) **Statement I** and **Statement II** both are correct.
(2) **Statement I** is correct, but **Statement II** is incorrect.
(3) **Statement I** is incorrect, but **Statement II** is correct.
(4) **Statement I** and **Statement II** both are incorrect.

154. Which of the following statements is **incorrect** regarding a myelinated nerve fibre?
(1) Myelinated nerve fibres are found in spinal and cranial nerves.
(2) They are enveloped with Schwann cells, which form a myelin sheath around the axon.
(3) It allows slow conduction of nerve impulses.
(4) The gaps between two adjacent myelin sheaths are called nodes of Ranvier.

155. Match **List-I** with **List-II** and find out the **correct** option.

List-I		List-II	
A.	The process of secreting ammonia	I.	Ammonotelic
B.	Marine fishes	II.	Ureotelic
C.	Freshwater fishes	III.	Uricotelic
D.	Land snails	IV.	Ammonotelism

	A	B	C	D
(1)	IV	III	II	I
(2)	II	I	IV	III
(3)	IV	II	I	III
(4)	IV	I	II	III

156. Which of the following sets of bones are a part of the pectoral girdle?
(1) Scapula, humerus and Ilium
(2) Clavicle, scapula and humerus
(3) Ilium, coccyx and scapula
(4) Ilium, ischium and clavicle

157. **Assertion (A):** During each cardiac cycle two prominent sounds are produced which can be easily heard through a stethoscope.
Reason (R): The first heart sound (lub) is associated with the closure of the semilunar valves whereas the second heart sound (dub) is associated with the closure of the atrioventricular valves.
(1) Both **Assertion (A)** and **Reason (R)** are true, and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion(A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

158. When a neuron is not conducting any impulse, i.e., resting, the axonal membrane is comparatively _____to potassium ions (K^+) and _____ to sodium ions (Na^+).
(1) impermeable; permeable
(2) nearly impermeable; impermeable
(3) permeable; freely allowing
(4) more permeable; nearly impermeable

159. Which of the following statements is/are **correct?**
A. In a typical muscle such as the biceps, striated (striped) skeletal muscle fibres are bundled together in a parallel fashion
B. The smooth muscle fibres taper at both ends (fusiform) and do not show striations.
C. Smooth muscles are 'involuntary' as their functioning cannot be directly controlled.
D. Communication junctions (intercalated discs) in smooth muscles at some fusion points allow them to contract as a unit.
(1) A, B and C
(2) B, C and D
(3) B and D
(4) C and D

160. The efferent arteriole emerging from the **___A___** forms a fine capillary network around the renal tubule called the **__B___**. A minute vessel of this network runs parallel to the **____C___** forming a '**U**' shaped vasa recta.

	A	B	C
(1)	Bowman's capsule	glomerulus	proximal convoluted tubule
(2)	Juxtaglomerular apparatus	capillaries	distal convoluted tubule
(3)	Bowman's capsule	glomerular capillaries	Henle's loop
(4)	glomerulus	peritubular capillaries	Henle's loop

161. Read the following from **A**-**D** and select the **correct** ones regarding muscles.

A. Amount of myoglobin is high in white fibrous muscles.
B. Red fibres contain plenty of mitochondria which can utilise the large amount of oxygen stored in them for ATP production.
C. White fibrous muscles are also called aerobic muscles.
D. The amount of sarcoplasmic reticulum is high in white fibrous muscles.

(1) A, B and C (2) B, C and D
(3) B and D (4) A and C

162. During the process of inspiration, an increase in pulmonary volume and thoracic volume results in;

(1) increase in intra-pulmonary pressure.
(2) decrease in intra-pulmonary pressure.
(3) no change in intra-pulmonary pressure.
(4) lifting up the ribs and sternum.

163. How many of the following statements are **incorrec**t regarding the generation and conduction of nerve impulses?

A. The electrical potential difference across resting plasma membrane is called action potential.
B. When a stimulus is applied at a site on the polarized membrane, the membrane at that specific site becomes impermeable to Na^+.
C. The rise in the stimulus-induced permeability to Na^+ is extremely short-lived.
D. A nerve impulse is transmitted from one neuron to another through junctions called synapses.
E. Chemicals called neurotransmitters are involved in the transmission of impulses at these synapses.

(1) Four (2) Five
(3) Three (4) Two

164. **Statement I:** Nephridia or flame cells are the excretory structures in Platyhelminthes (Flatworms, e.g., *Planaria*), rotifers, some annelids and the cephalochordate – *Amphioxus.*

Statement II: Nephridia help to remove nitrogenous wastes and maintain a fluid and ionic balance.

(1) Statement I and statement II both are correct.
(2) Statement I is correct, but statement II is incorrect.
(3) Statement I is incorrect, but statement II is correct.
(4) Statement I and statement II both are incorrect.

165. Which of the following options is/are an example of respiratory disorders?

A. Cystic fibrosis
B. Asbestosis
C. Silicosis
D. Emphysema

(1) A, B and D only
(2) B, C and D only
(3) B and C only
(4) B only

166. During muscle contraction, which of the following retains its length?

(1) I band (2) Sarcomere
(3) A band (4) H zone

167. Match **List-I** with **List-II** regarding ionic activities associated with various phases of an action potential.

List-I		List-II	
A	Depolarization phase in the generation of an action potential	I	opening and then closing of Na^+ channels
B	Repolarization phase in the generation of an action potential	II	All voltage-gated sodium and potassium channels are closed
C	Absolute refracting phase	III	The sodium channel remained open
D	Resting phase	IV	opening of potassium gates and rushing of potassium

	A	B	C	D
(1)	I	II	III	IV
(2)	II	I	IV	III
(3)	III	IV	I	II
(4)	I	IV	III	II

168. **Assertion (A):** Bones have a hard and non-pliable ground substance rich in calcium salts and collagen fibres which give bone its strength.

Reason (R): Cells of this tissue are enclosed in small cavities within the matrix secreted by them.

(1) Both **Assertion (A)** and **Reason (R)** are true, and **Reason (R)** is a correct explanation of **Assertion (A)**.

(2) Both **Assertion (A)** and **Reason (R)** are true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.

(3) **Assertion(A)** is true, and **Reason (R)** is false.

(4) **Assertion (A)** is false, and **Reason (R)** is true.

169. Which part of a nephron is responsible for conditional reabsorption of Na^+ and water?

(1) Ascending limb of the loop of Henle

(2) Descending limb of the loop of Henle

(3) Proximal convoluted tubule

(4) Distal convoluted tubule

170. The opening between the right atrium and the right ventricle is guarded by ___**A**___ valve, whereas a ____**B**___ valve guards the opening between the left atrium and the left ventricle.

Choose the option **correctly** representing the value of **A** and **B**.

	A	**B**
(1)	mitral	tricuspid
(2)	tricuspid	semilunar
(3)	tricuspid	bicuspid
(4)	bicuspid	semilunar

171. **Statement I:** Dense irregular tissue present beneath the skin which serves as a support framework for epithelium and contains fibroblasts (cells that produce and secrete fibres), macrophages and mast cells.

Statement II: In the dense regular connective tissues, the collagen fibres are present in rows between many parallel bundles of fibres.

(1) Statement I and statement II both are correct.

(2) Statement I is correct, but statement II is incorrect.

(3) Statement I is incorrect, but statement II is correct.

(4) Statement I and statement II both are incorrect.

172. How many of the following statements are **correct**?

A. Each vertebra has a central hollow portion (neural canal) through which the spinal cord passes.

B. First vertebra is the axis and it articulates with the occipital condyles.

C. The vertebral column is differentiated into cervical (7), thoracic (12), lumbar (7), sacral (1-fused) and coccygeal (1-fused) regions starting from the skull.

D. The vertebral column protects the spinal cord, supports the head and serves as the point of attachment for the ribs and musculature of the back.

(1) Two (2) One

(3) Three (4) Four

173. Select the option which **correctly** matches.

(1)	Right upper corner of the right atrium	SA node
(2)	Lower left corner of the right atrium	Bundle of His
(3)	Right Atrioventricular valve	Mitral valve
(4)	Left Atrioventricular valve	tricuspid valve

174. Which of the following statements is/are **correct** for the blood group?

A. Blood group O contains no antigen and both anti A and B antibodies in plasma.

B. Blood group AB is a universal donor.

C. Blood group A contains antigen B and anti-A antibodies.

D. Blood group B contains antigen B and anti-A antibodies.

(1) A and D (2) A, B and C

(3) A, B and D (4) A, C and D

175. Which one of the following is a cranial bone?

(1) Zygomatic (2) Lacrymal

(3) Ischium (4) Ethmoid

176. Which of the following statements is **incorrect**?

(1) Counter-current flow of blood in the vasa recta helps to retain the reabsorbed sodium in the renal medulla.

(2) Glomerular filterate is protein-free plasma.

(3) Vasa recta carry glomerular filterate from the distal convoluted tubule to the collecting duct.

(4) Glomerular filterate in Bowman's capsule is isotonic to the plasma.

177. Corpora quadrigemina is a part of;
(1) Forebrain
(2) Midbrain
(3) Hindbrain
(4) Peripheral nervous system

178. Which of the following statements regarding dense connective tissue is **incorrect**?
(1) Fibres and fibroblasts are compactly packed
(2) The orientation of fibres shows a regular or irregular pattern and are called dense regular and dense irregular tissue respectively.
(3) Tendons, which attach skeletal muscles to bones and ligaments which attach one bone to another are examples of this tissue.
(4) Dense irregular connective tissue has fibroblasts and many fibres (mostly elastin) that are oriented differently.

179. Malfunctioning of kidney leading to accumulation of urea in blood is referred to as;
(1) glycosuria.
(2) anuria.
(3) uremia.
(4) glomerulonephritis.

180. **Assertion (A):** Myasthenia gravis is an autoimmune disorder affecting the neuromuscular junction leading to fatigue, weakening and paralysis of skeletal muscle.
Reason (R): Muscular dystrophy is a progressive degeneration of skeletal muscle mostly due to a genetic disorder.
(1) Both **Assertion (A)** and **Reason (R)** are true, and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion(A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

181. Which of the following statements is **incorrect**?
(1) The cerebrum forms the major part of the human brain.
(2) A deep cleft divides the cerebrum longitudinally into two halves, which are termed the left and right cerebral hemispheres.
(3) The hemispheres are connected by a tract of nerve fibres called cerebral aqueducts.
(4) The layer of cells which covers the cerebral hemisphere is called the cerebral cortex and is thrown into prominent folds.

182. Match **List-I** with **List-II** and choose the **correct** option.

List-I		**List-II**	
A.	Total lung capacity	I.	2500 mL to 3000 mL
B.	Inspiratory reserve volume	II.	1000 mL to 1100 mL
C.	Expiratory reserve volume	III.	4000 mL to 4500 mL
D.	Vital capacity	IV.	5500 to 6000 mL

	A	**B**	**C**	**D**
(1)	IV	I	II	III
(2)	I	IV	III	II
(3)	III	II	I	IV
(4)	I	IV	II	III

183. Adipose tissue is an example of;
(1) dense regular connective tissue.
(2) dense irregular connective tissue.
(3) loose connective tissue.
(4) specialized connective tissue.

184. During the process of haemodialysis, the blood drained from ___**A**___ is pumped into a dialysing unit called ____**B**____.
Choose the **correct** option representing **A** and **B**.

	A	**B**
(1)	vein	hemoanalyzer
(2)	kidney	hemodialyzer
(3)	artery	artificial kidney
(4)	renal vein	hemodialyzer

185. Which of the following statements is **not true** regarding synovial joints?
(1) Synovial joints are characterised by the presence of cartilage between articulating surfaces of the two bones.
(2) The arrangement in the synovial joint allows considerable movement.
(3) These joints help in locomotion and many other movements.
(4) Ball and socket joint (between the humerus and pectoral girdle), hinge joint (knee joint), and pivot joint (between atlas and axis) etc. are some examples.

SECTION-B

186. **Assertion (A):** The cerebrum wraps around a structure called the hypothalamus, which is a major coordinating centre for sensory and motor signalling.
Reason (R): The inner parts of cerebral hemispheres and a group of associated deep structures like the amygdala, hippocampus, etc., form a complex structure called the limbic lobe or limbic system.
(1) Both **Assertion (A)** and **Reason (R)** are true, and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion(A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

187. How many of the following statements are **true** regarding the loop of Henle?
A. Reabsorption is minimal in its ascending limb.
B. The ascending limb of the loop of Henle is permeable to water but almost impermeable to electrolytes.
C. The descending limb is impermeable to water but allows the transport of electrolytes actively or passively
D. This region plays a significant role in the maintenance of high osmolarity of medullary interstitial fluid.
(1) One (2) two
(3) Three (4) Four

188. Which of the following types of formed elements reduce in number when a person is suffering from a viral infection?
(1) Erythrocytes (2) Leucocytes
(3) Platelets (4) Haemoglobin

189. Which part of the contractile protein of skeletal muscle contains the ATPase enzyme needed for muscle contraction?
(1) Actin
(2) Light meromyosin
(3) Heavy meromyosin
(4) Tropomyosin

190. The function of the corpus callosum is to connect;
(1) two ventricles of brain.
(2) cerebral hemispheres.
(3) two optic lobes.
(4) two cerebellar hemispheres.

191. **Assertion (A):** The kidneys have built-in mechanisms for the regulation of the glomerular filtration rate.
Reason (R): JGA is a special sensitive region formed by cellular modifications in the distal convoluted tubule and the afferent arteriole at the location of their contact.
(1) Both **Assertion (A)** and **Reason (R)** are true, and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion(A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

192. Which one is anatomically **incorrect**?
(1) Cranial bones: 8 in number
(2) Thoracic vertebrae: 7 in number
(3) Phalanges in digits: 14 in number
(4) Floating ribs: 2 pairs

193. **Correctly** identify the main functions of the cerebrum of the human brain from the given statements.
A. Control the contraction of voluntary muscles through the frontal lobe.
B. Control the sensitivity, movement, memory, vocabulary etc. through the frontal lobe.
C. Control the temperature, taste, touch, pain etc. through the parietal lobe.
D. Control the hearing and sense of smell through the occipital and frontal lobes.
(1) A, B and D only
(2) A, C and D only
(3) A, B and C only
(4) B, C and D only

194. Match **List-I** with **List-II** and choose the **correct** option.

	List-I		**List-II**
A.	Medulla oblongata	I.	Regulates respiration
B.	Hypothalamus	II.	Controls vision and hearing
C.	pons	III.	Control the rate of heartbeat
D.	Cerebrum	IV.	Controls the pituitary

	A	**B**	**C**	**D**
(1)	III	IV	I	II
(2)	IV	III	II	I
(3)	III	IV	II	I
(4)	IV	III	I	II

195. _____ type of joint is present between the atlas and axis.

(1) Pivot joint
(2) Hinge joint
(3) Cartilaginous joint
(4) Fibrous joint

196. **Statement I:** Heart failure means the state of the heart when it is not pumping blood effectively enough to meet the needs of the body.
Statement II: In a heart attack symptom of acute chest pain appears when not enough oxygen is reaching the heart muscle.

(1) Statement I and Statement II both are correct.
(2) Statement I is correct, but Statement II is incorrect.
(3) Statement I is incorrect, but Statement II is correct.
(4) Statement I and Statement II both are incorrect.

197. Which of the following options **correctly** represents the function of node of Ranvier in a neuron?

(1) Providing electrical insulation to nerve
(2) Speeds up the transmission of nerve impulse
(3) Conduction of nerve impulse
(4) Secretion of myelin sheath

198. A fall in glomerular blood flow/glomerular blood pressure/GFR can activate the **___X___** to release renin which converts **___Y___** in blood to angiotensin I.

	X	**Y**
(1)	Podocyte	Angiotensin II
(2)	Juxtaglomerular cells	Angiotensinogen
(3)	Afferent arteriole	Angiotensinogen
(4)	Juxtaglomerular cells	Angiotensin II

199. **Assertion (A):** Expiratory capacity includes tidal volume and expiratory reserve volume (TV+ERV).
Reason (R): It is the total volume of air a person can expire after a normal inspiration.

(1) Both **Assertion (A)** and **Reason (R)** are true, and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion (A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

200. Choose the **incorrect** statement regarding the human skull.

(1) It is dicondylic.
(2) It includes 6 ear ossicles.
(3) It includes 14 facial bones.
(4) Hyoid is not included in skull bones.

■■■

SPACE FOR ROUGH WORK

PW Web/App - https://smart.link/7wwosivoicgd4

Library- https://smart.link/sdfez8ejd80if